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Abstract

THE ROLE OF DILUENT IN EXTRACTION PROCESSES

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In many practical extraction processes suitable diluents have been used with the aim to improve the physical properties of the organic phase employed.

Although these diluents were selected from the solvents which are chemically inert, nevertheless they are taking a more or less, active part in the extraction process, with influence upon the partition coefficients. In previous studies carried out in this Institute it was suggested that an appropriate approach to this problem must take into account two independent chemical interactions in the organic phase influencing the extraction equilibrium. These are: the interaction between the extracting agent and the diluent and the interaction between the extracted species and the diluent. To understand the overall effect of the diluent, at least one of these interactions should be measured directly, the other can then be calculated from the measured partition coefficient. The most convenient procedure is to determine the thermodynamic activity of the extracting agent as a function of the composition of the organic phase. This can be done by studying the partition of the extracting agent between the organic phase and an aqueous phase of constant composition. The thermodynamic activity of the extracting agent easily can be related to the mode of interaction with the diluent.

The suggested method is of general applicability and was previously successfully used in the study of the TBP and amine extraction systems. Since acidic extracting agents become more and more important and very probably may find application in fuel reprocessing, it seemed to be worth of applying this method to such systems.

In the experimental part of this paper some recent results are presented on the extraction of europium with dibutylphosphate /DBP/. According to the method discussed above, first, the thermodynamic activity of DBP in seventeen diluents was determined by measuring the partition of this extractant between the organic and aqueous phase. From the measured activity of the extracting agent, and from

the europium partition data obtained for the same concentration of DBP, the magnitude of the interaction between the Eu-DBP complex and the diluent was calculated in the form of the thermodynamic activity coefficient. The interaction with the diluent was explained in part by the application of the concept with regard to the solubility parameter as a measure of the intermolecular interaction involved. The important role of interaction through hydrogen bonding of both the extractant and the complex with some diluents was revealed.